and without an exact reference, for a valuable paper. The number of papers of permanent value in these old periodicals is very small: subsequent researches have thrown them out of date; the mere efflux of time has proved some of them to be useless; many deal with temporary subjects, which are now of no importance to anyone. Such a periodical, for example, as the old *China Repository*, printed partly in Canton—the Canton of the old days—now fetches an absurd price. Sets have been sold in recent years at from £30 to £50; yet all that it contains of value now could be placed in two volumes such as these before us. The demand for special works of this character, however, is too small to induce any publisher to incur the risk of producing them; and hence it is that we are thrown back on the learned Societies, which represent the students of to-day, to place within our reach the labours of past generations of scholars, and of the literary and intellectual fathers that begat them. This, however, is a question for the Societies themselves, for their own members must feel more acutely than anyone else the truth of these observations.

We have already mentioned a few of the papers of scientific interest in the present series. If Mr. Logan's paper on the peculiar rocks of Pulo Ubin, an island near Singapore, is not out of date at present, it probably soon will be if the long-promised survey of the part of the Malay Peninsula under British influence is to be thoroughly carried out. Dr. F. Stoliczka has a short paper on some species of Malayan Amphibia and Reptilia, and a longer one on the land-shells of Penang; while Father Borie describes the Mantras, amongst whom he laboured as a missionary for some years. This is one of the aboriginal tribes of the peninsula, which were driven inland by the great Malay invasion of the twelfth century. Of these, the Karens inhabit the north and part of Burmah, the Semangs the States of Kedah, Perak, and Selangore, the Mantras the region lying between the latter territory and Mount Ophir, the Jakons and Sambinbangs the southern part of the peninsula. The writer describes the manners and habits of the people in some detail. A most interesting paper, and one of the longest, is Dr. Friederich's account of the language, literature, religion, and castes of the people of Bali, an island which occupies a peculiar relation in the history of the civilization of the Malay Peninsula and Archipelago. The editor in his introduction describes that position in these words:—

> "The continued existence, in unabated vitality, of a nationalized Hinduism, blended with pre-Hindu customs and practices, among a spirited and vigorous people is not only . . . a kind of commentary on the ancient condition of the natives of Java, it allows us also to draw a fair inference as to the kind of Hinduism at one time prevailing in other parts of Malaysia less favoured by historical records, where ruthless Islam has since obliterated to a great extent the traces of other creeds, traditions, and institutions. It is, indeed, essential to a proper understanding and estimate of the religious and social condition of the various and wide-spread Malayan tribes that the influence which Hindu civilization has, in a greater or lesser degree, exerted upon them, should as far as possible be investigated."

It should be mentioned that the last number of the Proceedings of the Dutch Geographical Society contains a paper on the same subject by Count Limburg Sturm, who visited the island last year.

Finally, there are certain "Notices on Zoological Subjects," and "Descriptions of Malayan Plants," reprinted from an English periodical published at Bencoolen nearly seventy years ago, with a note to the letter by Sir Joseph Hooker and Mr. Hervey, correcting the terminology. In the preface the editor quotes part of a letter from Sir Joseph pointing to a speedy investigation of the flora of the Malay Peninsula, for which he has urged the Colonial Government to contribute funds. Seeing that Dr. Rost has had to go back to 1820 for an account of the flora, it seems almost time that Sir Joseph Hooker's advice should be taken by Sir Cecil Smith and the Legislative Council of the Straits Settlements.

THE ZOOLOGICAL RESULTS OF THE "CHALLENGER" EXPEDITION.

Report on the Scientific Results of the Voyage of H.M.S. "Challenger" during the Years 1873-76, *under the command of Capt. George S. Nares, R.N., F.R.S., and the late Capt. F. T. Thomson, R.N.* Prepared under the superintendence of the late Sir C. Wyville Thomson, Knt., F.R.S., &c., and now of John Murray, one of the Naturalists of the Expedition. Zoology—Vol. XXII. (Published by Order of Her Majesty's Government, 1887.)

VOLUME XXII. contains the Report, by Dr. Günther, Keeper of the Department of Zoology in the British Museum, on the deep-sea fishes collected during the cruise.

Originally it was intended to fix an arbitrary depth as distinguishing between the shore and deep-sea fishes, and accordingly, in the author's previous Report on the shore fishes of the *Challenger* Expedition, all those fishes captured at a less depth than 350 fathoms were treated as more or less littoral forms. However, the subsequent Norwegian and North American explorations brought to light instances of fishes with an unmistakably bathybial organization occurring at a much shallower depth than the forms discovered by the *Challenger*; or, on the other hand, showed that certain littoral forms descend not only to 100 but even to beyond 300 fathoms.

In the present Report, the 100-fathom line is adopted as the boundary at which, with the extinction of sunlight, the bathybial fauna commences, sporadically, no doubt, and largely mixed with surface forms.

The material which forms the subject of this Report consisted of 794 specimens, of which 610 were obtained during the voyage of the *Challenger*, 88 on the cruises of the *Knight-Errant* and *Triton*, and 96 from other sources. These specimens are referred to 266 species, 177 falling to the share of the *Challenger*, and 14 being due to the exploration of the Faroe Channel. The number of new species discovered by the *Challenger* amounts to 144, whilst by the deep-sea exploration of the Faroe Channel 10 species have been added to the fauna of the British seas.

In the introduction we have a history of our present knowledge of the fish-fauna of the deep-sea, some account of the characteristics of deep-sea fish, and an account of their vertical and horizontal distribution.

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While no distinct bathymetrical zones, characterized by peculiar forms, can be defined, yet the following table clearly shows that the abundance of fish life decreases with the depth. There have been found between

Fathoms.	Species.
100–300	232
300–500	142
500–700	76
700–1500	56
1500–2000	24
2000–2900	23

While no doubt this decrease in numbers is partly due to the extreme difficulty of investigating the deep-sea fauna, it cannot but be also regarded as pretty certain that, while locally abundant as to individuals, the number of species found is but small.

The descriptions of the new genera and species, though abounding with interesting details in reference to the many strange forms described, cannot with the space at our disposal be even summarized,—they are such as would have been expected from the known skill and judgment of Dr. Günther; but we must find room for some allusion to the Report on the structure of the phosphorescent organs, on the head of Ipnops, by Prof. H. N. Moseley, and on the structure of the phosphorescent organs of fishes, by Dr. R. von Lendenfeld.

In *Ipnops murrayi* the eyes as well as the optic nerves are completely absent, but a pair of symmetrical luminous organs are to be found on either side of the median line of the upper flattened surface of its head, the upper wall of the skull where it covers them being completely transparent.

These phosphorescent organs are composed of hexagonal columnar masses, arranged with considerable regularity in rows, and resting inferiorly on a pigmented connective-tissue layer. Each hexagonal column is composed of a number (from thirty to forty) of transparent rods, disposed side by side at right angles to the outer surface of the organ, and with their bases applied against the concave surface of large hexagonal pigment cells, one of which forms the base of each hexagonal column. The basal pigment cells are also hexagonal in outline, and are cup-like, concavo-convex in form, and of the same breadth as the hexagonal columns. These organs receive a rich blood supply, and there appears little room for doubt but that the nerve supply comes from the fifth nerve. No trace of any other nerve supply has been found. From a comparison of these organs with those of a similar nature in other fish, the author concludes that they are but highly specialized and enormously enlarged representatives of the phosphorescent organs on the heads of such allied Scopelids as *Scopelus rafinesquii* and *S. metopoclampus*.

The Report of Dr. von Lendenfeld is of a more general character, treating as it does of the phosphorescent organs of most of the known phosphorescent fishes, though not alluding to those of Ipnops. These organs are classified into the regular ocellar organs and the irregular glandular organs. Both these classes are again subdivided in reference to their form or position; and in conclusion we have a comparison of the different phosphorescent organs of fishes, and of these as compared with similar organs in other animals.

Dr. von Lendenfeld sums up his investigations as follows:—(1) The phosphorescent organs of fishes are more or less modified glands which have partly been developed from simple slime-glands in the skin, and partly in connection with the slime-canal system; (2) the typical clavate cells are modified gland-cells; (3) the accessory reflectors and sphincters are developed from the skin around and below the gland; (4) the large suborbital organs are innervated by a modified branch of the trigeminus, and the other organs by the ordinary superficial nerves.

A splendid atlas of plates accompanies this volume. Of these, sixty-six represent the new species described by Dr. Günther, and several of them are folding plates; two illustrate the anatomy of the phosphorescent organs of *Ipnops murrayi;* and the remaining five are drawn by Dr. von Lendenfeld and illustrate in a very beautiful manner his Report on the phosphorescent organs just alluded to.

SALINE DEPOSITS.

Die Bildung des Natronsaltpeters aus Mutterlangensalzen. By Dr. Carl Ochsenius. (Stuttgart: E. Koch, 1887.)

THIS book is a very valuable contribution to the history of saline deposits in general, but it is especially useful on account of the author's detailed description of the salt-beds of Chili and Peru, to the study of which he mainly devotes his attention. He discusses the various theories which have from time to time been advanced to account for the formation of Chili saltpetre (sodium nitrate), and shows that it must be regarded as the product of the action of oxidizing guano on certain mother-liquors containing carbonate of soda.

The salt-beds on the west coast of South America are found in the rainless district which stretches from Payta (near Amotape), in Peru, as far south as the twenty-sixth parallel. This region forms a narrow strip along the coast-line, and rarely exceeds twenty-five miles in width. It is bounded on the east by a chain of the Andes, and in the southern portion of the district the coast is fringed with low-lying hills, known as the coast Cordilleras. The author considers that, before the upheaval of the Andes, salt began to deposit in certain bays, which had been wholly or partially shut off from the sea by the gradual formation of an intercepting bar. Then, while the process of evaporation was still incomplete, the district was raised by volcanic action, and the mother-liquors from the salt lakes eventually escaped, running down into the valleys, and, where they encountered no obstacle, reaching the sea. The coast Cordilleras acted as a barrier in the southern portion of the district; while in the northern part the liquors doubtless returned to the sea. The volcanoes which produced the aforesaid upheaval exhaled immense volumes of carbonic acid gas, and the author considers that a portion of the sodium chloride in the mother-liquors was thus converted into sodium carbonate. (The co-existence of borates goes far to confirm the source of carbonic acid.) The coast in this part of Chili is studded with small islands containing deposits of guano

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